Methods and arrangements for the use with combustion processes

Patent Number: GB1013015
Publication date: 1965-12-15
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Requested Patent: ☐ GB1013015
Application Number: GB19620031533 19620816
Priority Number(s): GB19620031533 19620816
IPC Classification:
EC Classification: F23C11/00F, H05H1/54, H02K44/18
Equivalents:

Abstract

1,013,015. Agitating by magnetic and electric fields. A. B. KJELLSTROM. Aug. 16, 1962, No. 31533/62. Heading B1C. [Also in Divi- sions F4 and H2] In a combustion process greater relative movement between the fuel and air is obtained by subjecting the charged particles to the action of electric and/or magnetic fields which oscillate with at least two different frequencies. As shown, region Q is the combustion zone and the gases within duct 1 are agitated by an electric field produced by electrodes 2, 3 and a magnetic field produced by coil 10 thereby intensifying the combustion process. The hot combustion products then pass through an energy conversion region P where they inter- act with magnetic fields A-E to generate power between the pairs of electrodes and finally to a heat exchanger (boiler) region R where the gases are again agitated by the field associated with electrodes 4, 5 to improve the heat-exchanger efficiency. Alternating fields having frequencies within the range of I c/s to 5 Mc/s, preferably as a multiple of the supply frequency, are stated to be used.

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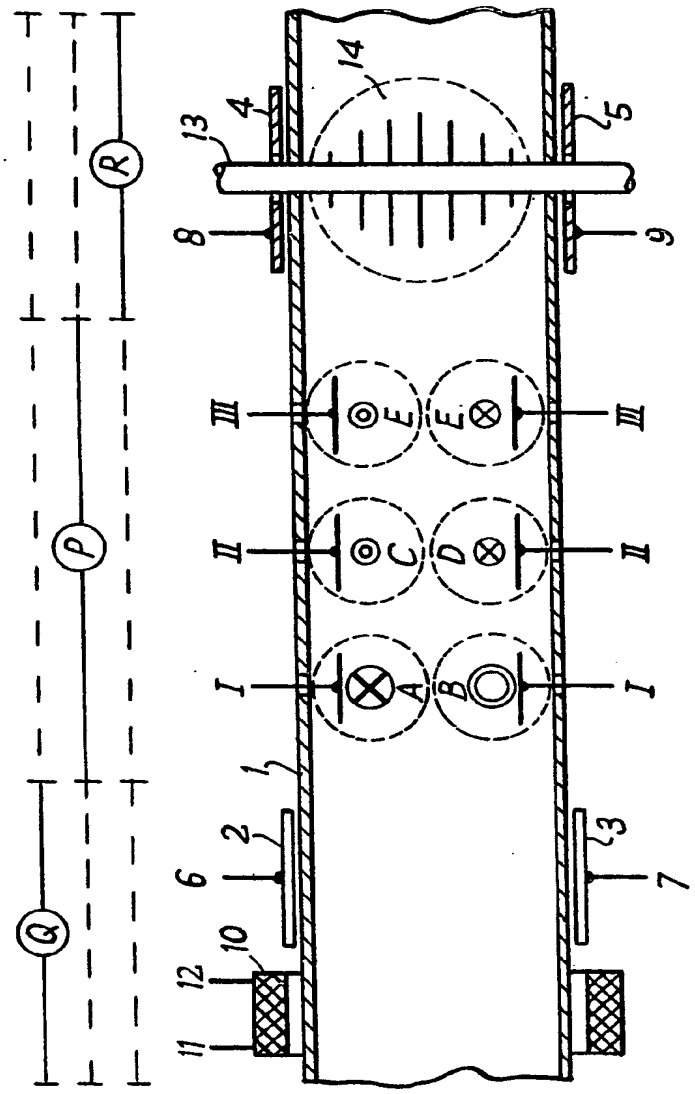
1,013,015
1 SHEET

COMPLETE SPECIFICATION

This drawing is a reproduction of the Original on a reduced scale.



1,013,015

PATENT SPECIFICATION

1,013,015

Date of Application and filing Complete Specification: August 16, 1962. *No. 31533/62*

Complete Specification Published: December 15, 1965.

Index at Acceptance:—H2 A (1P, 1Q): B1 C18X1; F4 B (A8X, A26).

Int. Cl.:—H 02 k 43/00 // B01f, F23c.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Methods and Arrangements for the use with Combustion Processes

I, AXEL BERTILSSON KJELLSTROM, a Swedish subject, of Angskarsgatan 3, Stockholm NO, Sweden, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to combustion processes and in particular to the acceleration and improvement of combustion by the action of an oscillating electric and/or magnetic field on charged particles taking part in the combustion process.

Such charged particles will commonly be present as a result of ionisation by the heat of the reaction. The oscillating field will impart oscillating motion to, or influence such motion in, the ionised medium. The increased relative motion between media taking part in the combustion process, for example between fuel and air, and between one or more reacting media and heat exchange or boundary surfaces has an accelerating or intensifying action on the combustion process. This may result from changes in boundary layer conditions in a solid or liquid body, for example a solid particle or a drop of liquid. Increased ionisation as a result of higher temperatures will increase the effect of the oscillating field.

The desired relative motions are produced by utilising the various mass, ionisation, charge and dipole conditions which exist in the heat-ionised medium, which may contain molecules, ions, solid and liquid bodies, and these conditions may also be influenced in the required direction, for example by adding substances capable of modifying these conditions. The motions may be the direct result of the fields or an indirect result caused by collisions.

In the process in accordance with the invention combustion is accelerated by subjecting charged particles taking part in the combustion to the action of at least one electric and/or magnetic field which is caused to oscillate at at least two different frequencies.

The field or fields may be generated by alternating field generators or by resonance oscillations. The frequencies are selected with regard to the size and mass of the charged particles and the viscosity and other physical properties of the medium in which they move in order to achieve the desired relative motion. One frequency may serve as a carrier frequency which is modulated by another frequency. The frequencies may be modulated with variable amplitudes, pulses, frequencies and/or phase conditions and in particular a frequency may be continuously varied. The frequencies may lie within the range 1 c/s. to 5 Mc/s. and preferably 1 c/s. to 100 Kc/s. One or more frequencies may be a multiple of 50 or 60 c/s.

One or more of the fields may be arranged to have a frequency and amplitude such that the motions produced by them oppose or cancel motions induced by other means. In this manner harmful oscillations, for example vibrations occurring in jet engines and turbines, may be reduced or cancelled out.

With due regard to temperature conditions and effects, for example cracking and condensation phenomena, arrangements for the utilisation of the invention may be partly or wholly located outside the combustion zone.

The invention brings the important advantage that cracking phenomena may be counteracted and cracking products, etc. may be freed by the relative motion produced.

The invention may be used with all types of fuel whether solid, pulverulent, liquid,

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gaseous or vaporous.

By way of example, an embodiment of the invention is shown schematically in the accompanying drawing.

The wall 1 of a vessel is constructed of materials which in suitable parts are electrically non-conducting and/or non-magnetic under operating conditions. The wall or walls of the vessel enclosing the reaction chambers need not be symmetrically arranged and can have any shape and be split up by dividing walls and/or passages. One or more of the media taking part in the combustion are assumed to travel through the vessel and to pass through regions P, Q and R, of which the region Q is a combustion region, the region R a heat exchange region and the region P a region where the temperature or ionisation conditions brought about according to the invention may be utilised for energy conversion. There may be several regions Q, P and R, which need not be sharply defined but may partly or completely overlap each other.

Electrodes 2, 3, 4 and 5 are arranged outside the vessel 1 and are connected by conductors 6, 7, 8 and 9 respectively, either directly or indirectly, for example through transformers, with one or more energy sources, such as alternating current generators, oscillators or frequency converters. A solenoid 10 with leads 11 and 12 serves to generate a magnetic field in the combustion zone.

The flame of the combustion is contained partly or completely within the area of active influence of the alternating fields for accelerating the combustion. These fields may also include one or more other sections of the combustion zone and may be supplemented by fields produced by other electrodes and coils. The electrodes and solenoids are only shown schematically and their number and disposition may be varied according to the fields required.

The frequencies are produced in the electric and magnetic fields by applying currents or voltages with these frequencies to the coils or electrodes generating the fields in conventional manner. The frequencies are chosen with regard to the physical characteristics of the charged bodies in the ionised medium in such a way as to achieve the desired motion for the various kinds of charged body present.

A heat exchanger 13 is mounted across the vessel 1 and the process of heat exchange between the combustion gases and the medium flowing through the heat exchanger may be influenced by a magnetic field 14 and/or the field produced by the electrodes 4 and 5.

Magnetic fields A, B, C, D, E, and F are orthogonal to the plane of the drawing and the field directions are shown conventionally by arrow points and tails. Charged particles travelling through the vessel may be made to move selectively towards one or more of the electrode groups I, II and III. With a particular phase relationship between the fields one type of charged particle may be induced by the fields C, D, E and F to travel to the electrode groups II and III while another type of charged particle is caused to move to the electrode group I by the more powerful magnetic fields A and B. By varying the strengths, directions and/or phase relationships of the magnetic fields in a periodic manner, it is possible to extract electrical energy from the arrangement, for example, three-phase alternating current.

Energy may also be produced through inductive and/or capacitive action by the electric charges or charge carriers.

A great number of advantages are achieved through the invention. Supervision and control may be made simpler, and are easily automatised and, by varying the conditions of relative motion, processes may be controlled according to requirements, effectively and by simple means. Installation and operating costs may be reduced and operating efficiencies improved.

WHAT I CLAIM IS:—

1. A combustion process in which combustion is accelerated by subjecting charged particles taking part in the combustion to the action of at least one oscillating electric and/or magnetic field which is caused to oscillate with at least two different frequencies.

2. A combustion process substantially as described with reference to the accompanying drawing.

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Berwick-upon-Tweed: Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd.—1965
Published at The Patent Office, 25 Southampton Buildings, London, W.C.2 from which copies may be obtained.